Chapter 6: Data Acquisition Methods, Procedures, and Issues

In this Exercise:

- Data Acquisition
- Downloading Geographic Data
- Accessing Data Via Web Map Service
- Using Data from a Text File or Spreadsheet
- Downloading Data from a GPS
- Creating and Editing Data
- Online Data Resources

This exercise requires an active Internet connection!

Data Acquisition

The data used in previous exercises has been provided on a CD or loaded directly on the computer.

In many situations users will want to build projects that include data acquired from other sources. In addition, users will frequently add data that they themselves have created to overlay with available geographic data.

The process of **Data Acquisition** involves a number of specific tasks that can be challenging. Procedures typically include:

- Locating and reviewing the properties of available geographic data
- Downloading files
- Extracting contents from compressed files (used to reduce file size)
- Transferring all relevant files to directories for use in the GIS application

There are a number of issues to consider when beginning the Data Acquisition process that can be identified by viewing available **Metadata**.

Data Acquisition and Metadata

Metadata should always accompany geographic data. As mentioned in previous chapters, metadata is the information that will tell potential users about the specific properties of geographic data layers. All VCGI metadata follows a federal format, however any metadata is better than none! Even a brief paragraph about who created it, why, and when as well as definitions of codes can be invaluable. Ask for information about the data when you get it from a source other than VCGI, and create simple metadata if you create new GIS data.

1. GIS File Formats

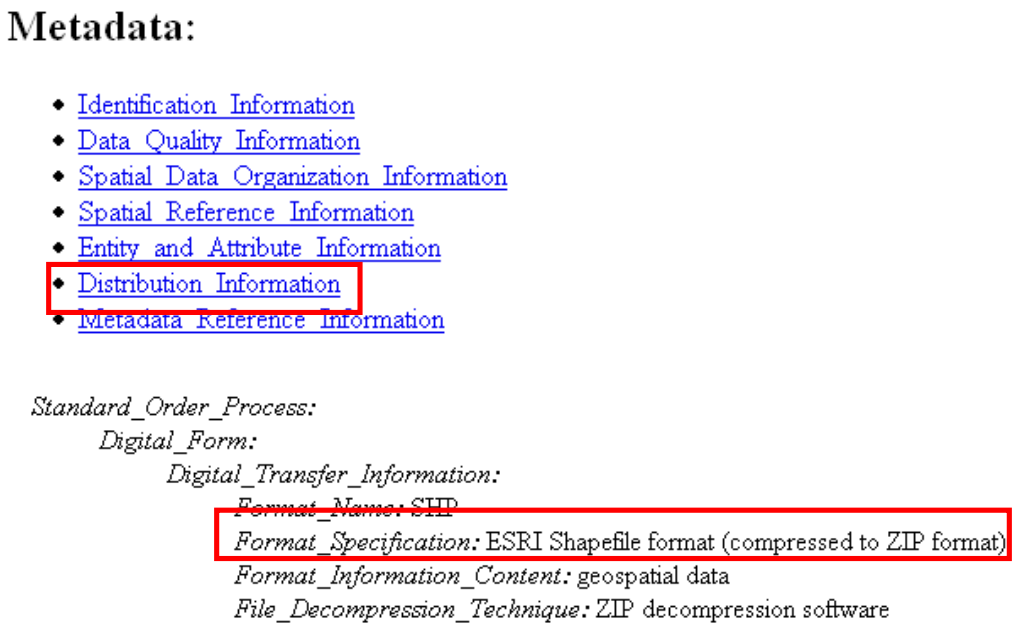
Geographic data may be available in a variety of file formats. Thus far we have used ESRI **Shapefiles** and **Imagery** in JPEG2000 or TIFF format.

QGIS can use data and data services of the following types:

- PostGIS and SpatiaLite
- Most vector formats supported by the OGR library, including ESRI shapefiles, MapInfo, SDTS and GML
- Raster formats supported by the GDAL library*, such as digital elevation models, aerial photography or landsat imagery
- GRASS locations and mapsets
- Online spatial data served as OGC-compliant WMS, WMS-C (Tile cache), WFS and WFS-T

A growing collection of open source software and utilities for GIS that may be useful for file conversions can be found on the Open Source Geospatial Foundation Website (http://www.osgeo.org/).

Metadata, as well as any online description, should include **Distribution Information** describing the format of the available digital data.

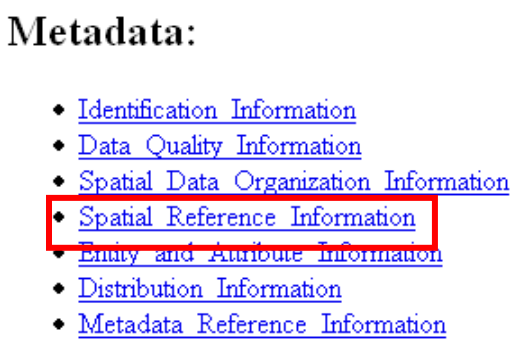


2. Coordinate System and Projection Information

In Chapter 4, we set the Coordinate Reference System to VT State Plane Meters, NAD 83. We also turned on the "Enable on the fly CRS

transformation" option because this will allow the software to transform data from whatever coordinate system and project it is natively in to the coordinate system and projection that we have set for our project. That way all of the data lines up and scales properly.

The **Spatial Reference Information** section of metadata will list information describing the coordinate system.



For example, the Vermont State Plane Coordinate System is a Coordinate System that has been projected. This means that the geographic data has been translated from a spheroid surface (the earth) onto a flat map. Metadata will include the projection (Transverse Mercator), the datum (NAD83), map units (Meters), as well as other specific values.

Understanding the specific values defined by a Coordinate System and Projection is critical when adding and assembling data themes in a GIS project and application (see below).

Downloading Geographic Data

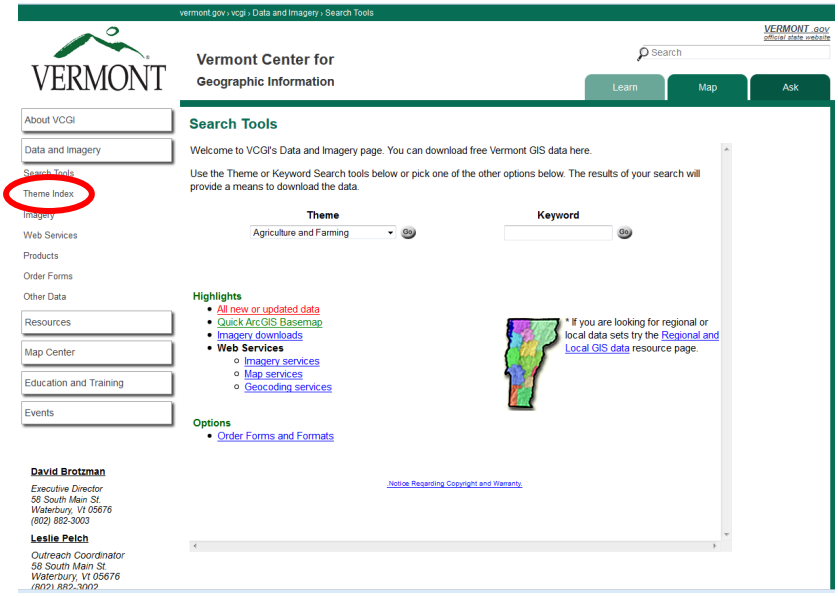
Geographic data is available online from a wide variety of sources and websites.

1. Vermont

The main source of public GIS data in Vermont is the **Data and Imagery** section of the VCGI website (http://vcgi.vermont.gov/). This online resource is available to users who wish to search for and download free Vermont GIS data from VCGI. Many of the data sets created by regional, state, and federal organizations are found here. Available data varies in content, scale, age, and accuracy.

It is important to refer to the associated metadata for each data layer.

Data is organized by Themes (categories) that may be searched on the warehouse site using the Theme search engine or the Theme Index page to view availability. The Keyword search provides another method for finding specific data layers.

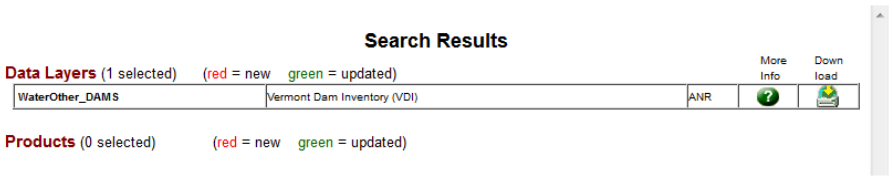


To understand the steps involved when acquiring data from the VCGI website, follow the instructions below to download a new data layer.

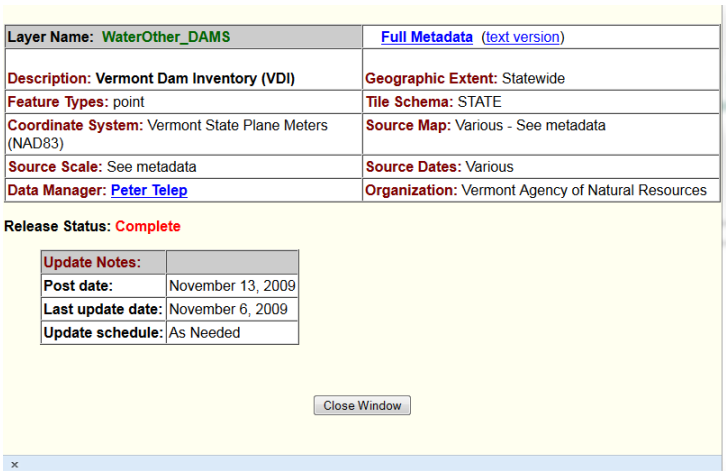
a) From the **Data and Imagery** page (http://vcgi.vermont.gov/warehouse/search_tools) type “dams” into the Keyword search

b) Click “Go”

c) Search results will display one (1) theme, WaterOther_DAMS.



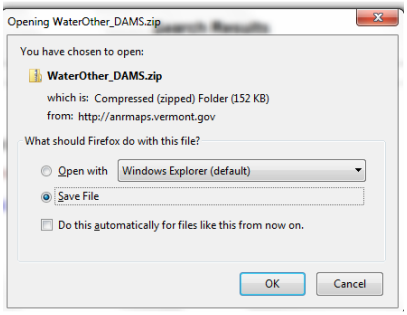
d) Click **More Info** to view additional information about this layer.



e) Click on **Full Metadata** to view the metadata file.

f) Close the metadata window when done.

g) In the Search Results window click on **Download** in order to download the whole statewide data layer.



h) In the Save As window change the name of the file to **dams.ZIP** and navigate to a directory where you have been instructed to save files and save this file.

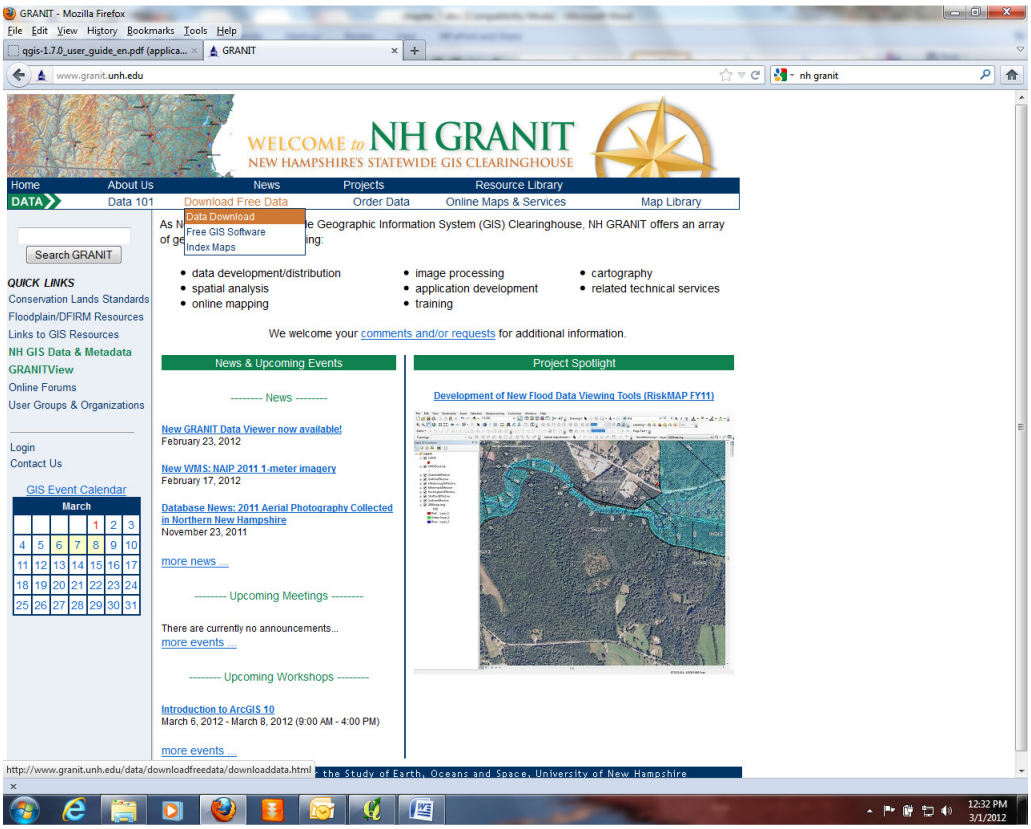
i) Using a file manager, navigate to where you have saved the file, right click and choose "extract all." Make sure to save the unzipped data to an appropriate folder.

When extracted there will be four (4) files that together are necessary for the ESRI Shapefile of dams in Vermont (points).

Name	Type	Size	Date Modified
EMERGENCY_DAMS_POINT.dbf	DBF File	1,169 KB	2/5/2007 1:55 PM
EMERGENCY_DAMS_POINT.prj	PRJ File	1 KB	2/5/2007 1:55 PM
EMERGENCY_DAMS_POINT.shp	SHP File	59 KB	2/5/2007 1:55 PM
EMERGENCY_DAMS_POINT.shx	SHX File	8 KB	2/5/2007 1:55 PM

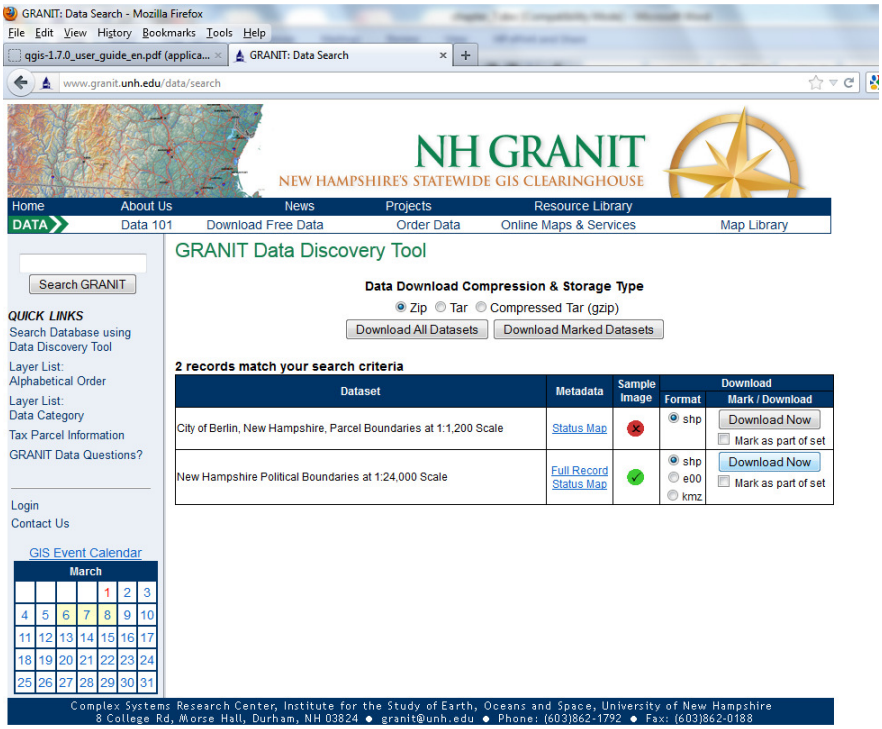
2. Data from Other Sources: NH Granit

a) If you will be using this NH data in an existing project that already contains data in a different coordinate system and projection (like VT State Plane NAD 83) make sure that your project settings include enabling "on the fly CRS transformation."
b) Go to **http://www.granit.unh.edu/**
c) Click on "Download Free Data">>"Data Download"



d) Click on " GRANIT Data Discovery Tool (DDT)"
e) Next to the words "Search by theme keyword:" type "Town" in the box
f) Click on the "Search" button

g) Download the data called "New Hampshire Political Boundaries at 1:24,000 Scale" by clicking on the "Download Now" button (notice the various settings and options, but leave them set to their defaults)



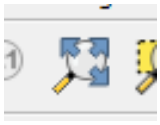
h) Save the .zip file in an appropriate location and then extract it to access the two shapefiles within: pba.shp (line data) and pbp.shp (polygon data). Each of these shapefiles contains political boundaries including town, county, and state. Check the metadata (the .html file) for the codes that allow you to symbolize the data.

i) Open QGIS

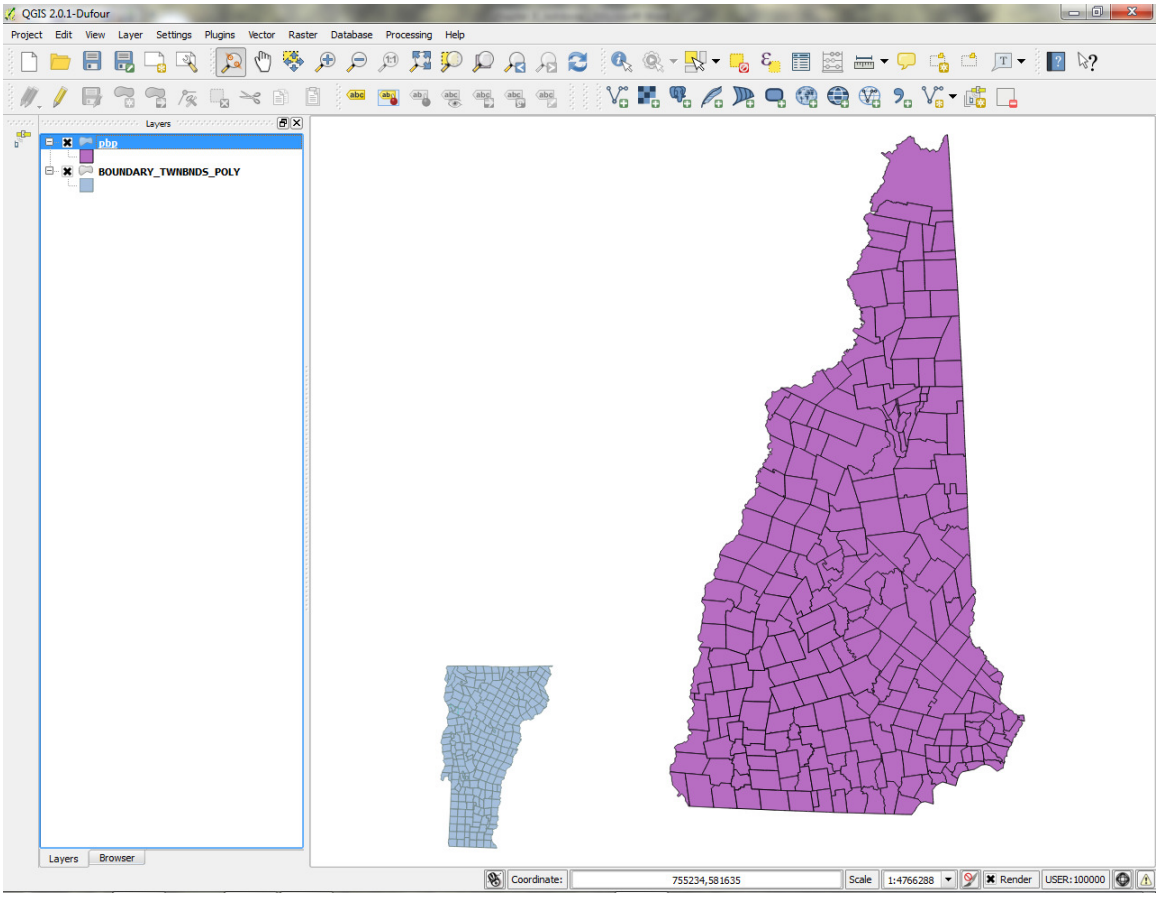
j) Add the data layer BOUNDARY_TWNBNDS_POLY.shp to the project.

k) Now bring the NH Town Boundary data into your project. Do you see the NH town boundaries?

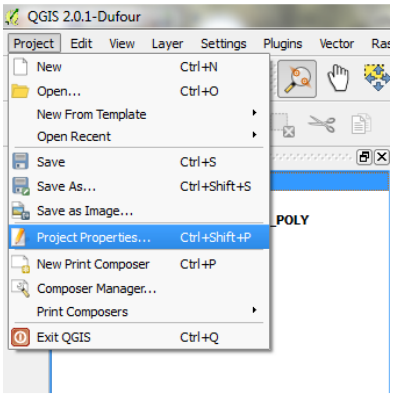
l) Click on the "zoom to full extent button"



m) You should see that the data from VT and NH are not lining up properly.



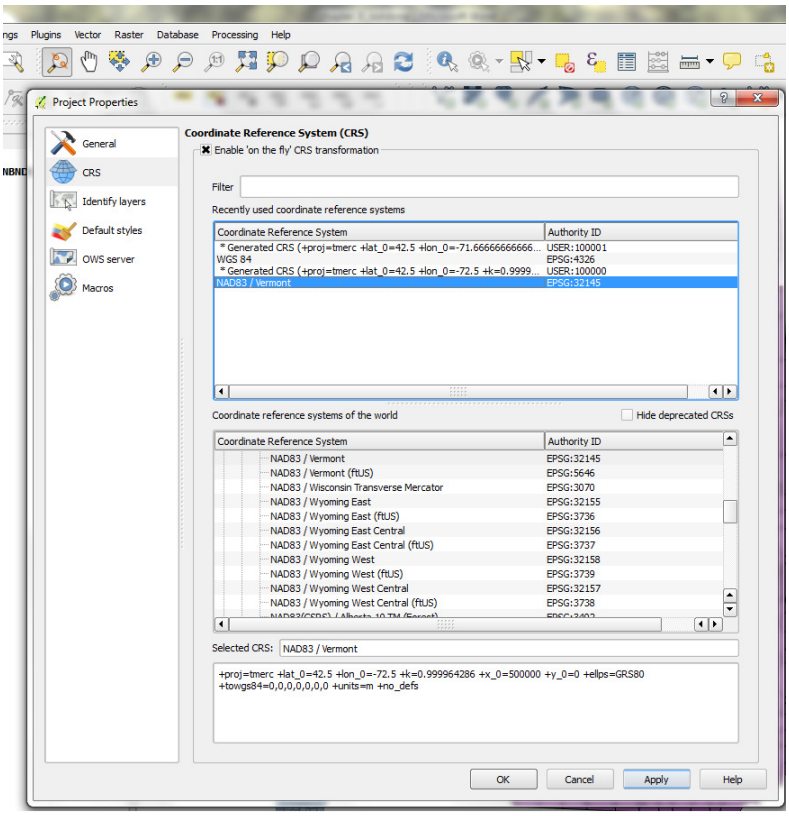
n) Click on the Project menu and then Project Properties

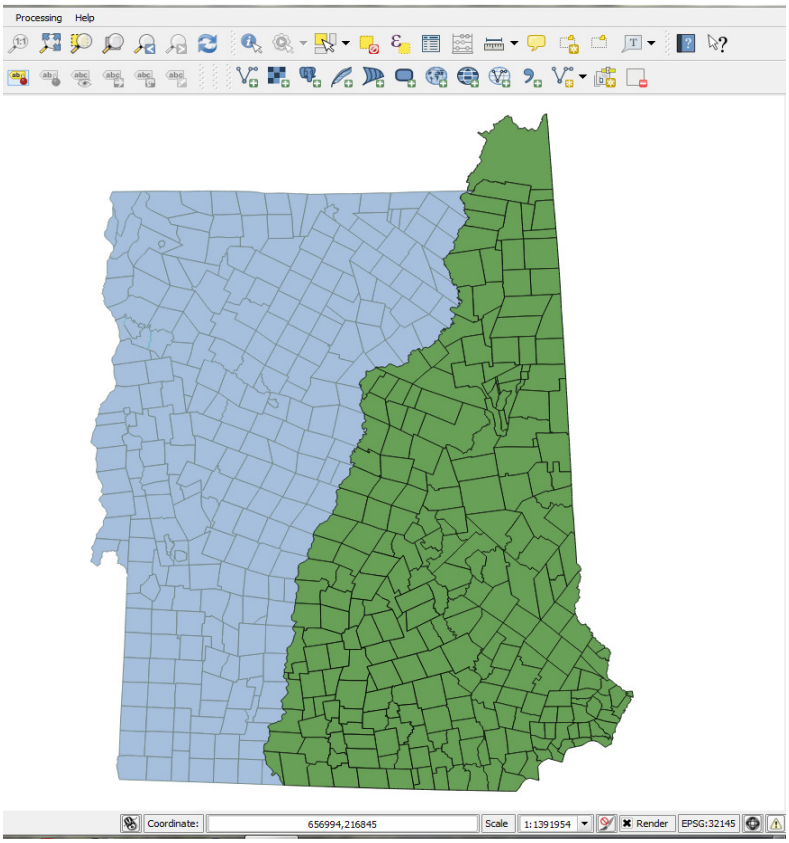


o) In the CRS tab, turn on “enable ‘on the fly’ CRS transformation”

p) Choose NAD83/Vermont and then click OK

q) You may need to remove the NH data and bring it in again in order to see that QGIS can indeed transform the data; it should be transformed to that same coordinate system and will therefore line up properly. This is because one of the files associated with the shapefiles you downloaded is the .prj file which basically says "this data is in NH State Plane Feet NAD 83." The software is able to do the mathematical transformation necessary to re-project the data.

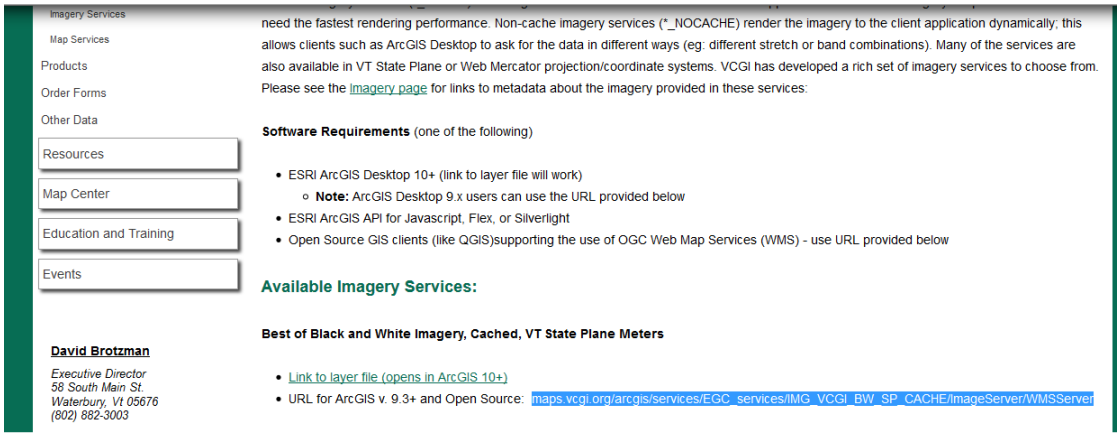

Plugins Vector Raster Database Processing Help
Project Properties
General
CRS
Identify layers
Default styles
OWS server
Macros
Coordinate Reference System (CRS)
Enable 'on the fly' CRS transformation
Filter
Recently used coordinate reference systems
Coordinate Reference System
Authority ID
* Generated CRS (+proj=tmerc +lat_0=42.5 +lon_0=-71.66666666666...
USER:100001
WGS 84
EPSG:4326
* Generated CRS (+proj=tmerc +lat_0=42.5 +lon_0=-72.5 +k=0.9999...
USER:100000
NAD83 / Vermont
EPSG:32145
Coordinate reference systems of the world
Hide deprecated CRSs
NAD83 / Vermont
EPSG:32145
NAD83 / Vermont (ftUS)
EPSG:5646
NAD83 / Wisconsin Transverse Mercator
EPSG:3070
NAD83 / Wyoming East
EPSG:32155
NAD83 / Wyoming East (ftUS)
EPSG:3736
NAD83 / Wyoming East Central
EPSG:32156
NAD83 / Wyoming East Central (ftUS)
EPSG:3737
NAD83 / Wyoming West
EPSG:32158
NAD83 / Wyoming West (ftUS)
EPSG:3739
NAD83 / Wyoming West Central
EPSG:32157
NAD83 / Wyoming West Central (ftUS)
EPSG:3738
Selected CRS: NAD83 / Vermont
+proj=tmerc +lat_0=42.5 +lon_0=-72.5 +k=0.999964286 +x_0=500000 +y_0=0 +ellps=GRS80
+towgs84=0,0,0,0,0,0,0 +units=m +no_defs
OK
Cancel
Apply
Help


Processing Help
Coordinate:
656994,216845
Scale
1:1391954
Render
EPSG:32145

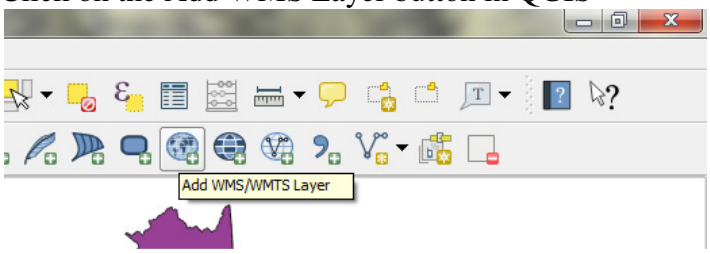
3. Accessing Data Via Web Map Service

VCGI, in collaboration with VT's Enterprise GIS Consortium (EGC), has developed a portfolio of "web services" which allow users to bring map layers and imagery into their GIS projects or map mashups without actually downloading any data. By connecting to the service of choice via the internet (a live internet connection is required in order for the images to appear in your GIS project) users can access a variety of resources (listed at the Web Services Page at VCGI's web site - http://vcgi.vermont.gov/warehouse/web_services).

a) Go to VCGI's web site to find and copy the Open Source URL to a particular web map or imagery service (see link above). An example would be: maps.vcgi.org/arcgis/services/EGC_services/IMG_VCGI_BW_SP_CACHE/ImageServer/WMSServer

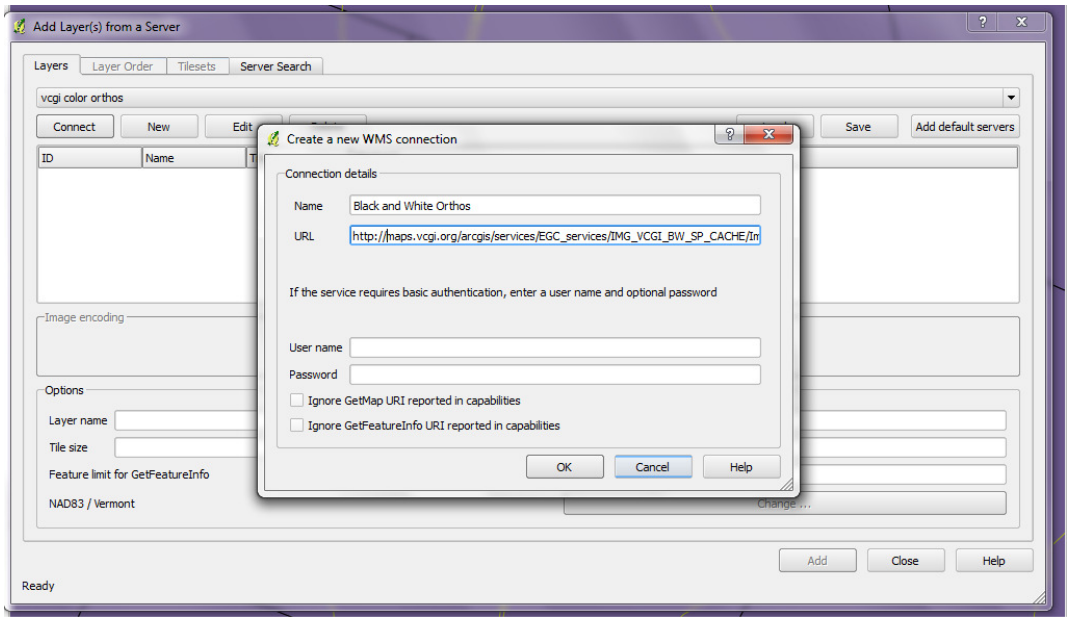


b) Click on the Add WMS Layer button in QGIS



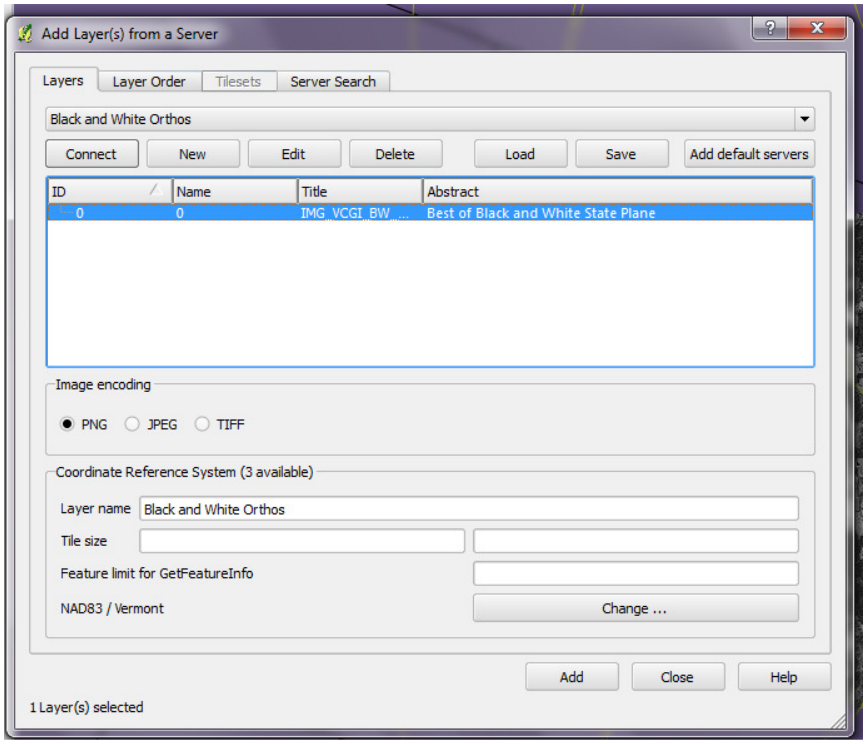
c) Click on New in the Add Layers from a Server window

d) Paste the URL you copied into the appropriate box, don't forget to ADD the http:// at the beginning and type a name into the Name box in the Create a New WMS Connection Window



e) Click OK

f) Click Connect



g) Click on the service to highlight it

h) Type a name in the Layer Name box

i) Make sure that the Image encoding is set to PNG or JPG!

j) Click Add then close the “Add Layers from a Server” window.

NOTE: If you add the VCGI Basemap Service, you will be better off adding individual layers from it rather than trying to add the whole thing at once. For some reason, QGIS does not interpret such a complicated service well, and much of the information is lost.

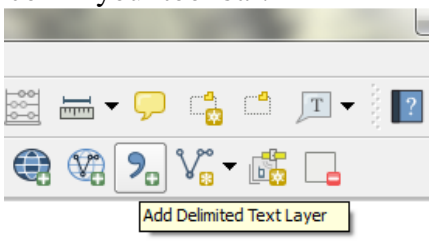
4. Data From a Text File or Spreadsheet

It is possible to use data from a delimited text file in a Quantum project if that data contains x, y coordinates of a known coordinate reference system (such as latitude longitude). If your data is stored in a spreadsheet, simply do a "save as" to create a .csv version of it (comma separated values).

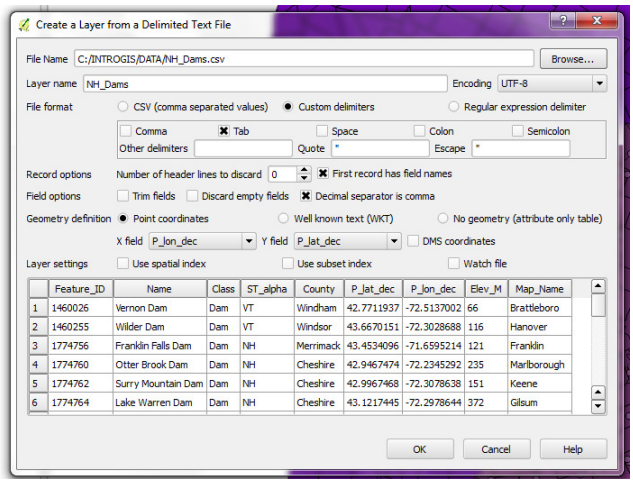
To view a delimited text file as layer, the text file must contain:

1. A delimited header row of field names. This must be the first line in the text file.
2. The header row must contain an X and Y field. These fields can have any name.
3. The x and y coordinates must be specified as a number. The coordinate system is not important.

We will use a function called "Add delimited text layer." You should see the following icon in your tool bar:

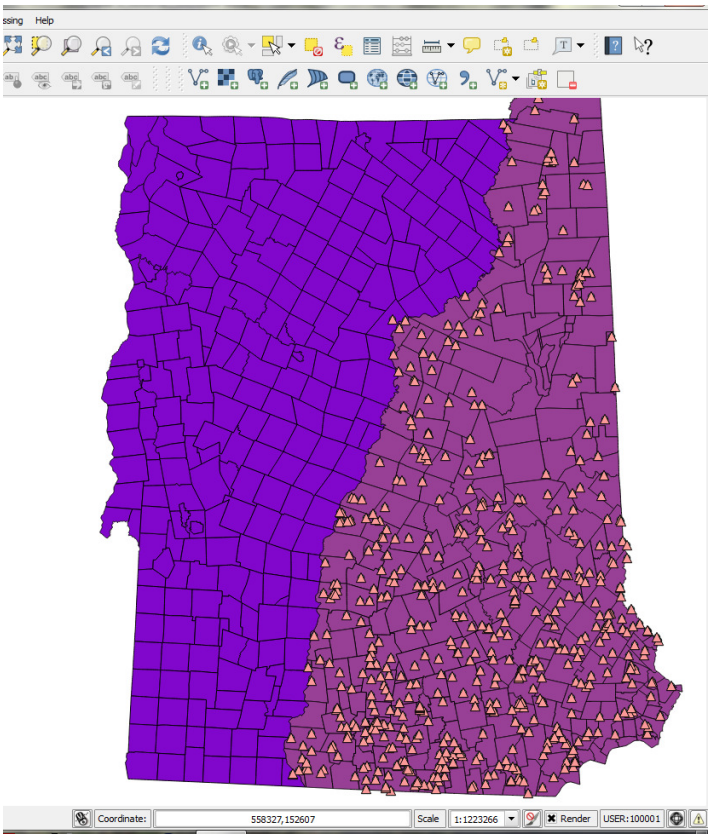


When you click on it a dialog box opens that allows you to indicate where your comma or tab delimited text file is located and which fields contain the latitude and longitude coordinates. You can use the file called "NH_DAMS.csv" found in your DATA directory or another file that your instructor may indicate.



Navigate to the location of the file, and make sure that all information in the dialog box is correct (is data delimited by tab or comma? Does the first row/record contain field names? Which fields contain the x/longitude info and y/latitude info?). The bottom window in the box will show what the data looks like based on the information you have provided, so you can make sure you have filled in the correct answers.

After you click on "OK" Quantum will ask you what Coordinate System the data is in. If you have latitude and longitude coordinates, choose from the "Geographic Coordinate Systems" and find "WGS 1984." Click "OK" and the data should appear on your map in the correct area!



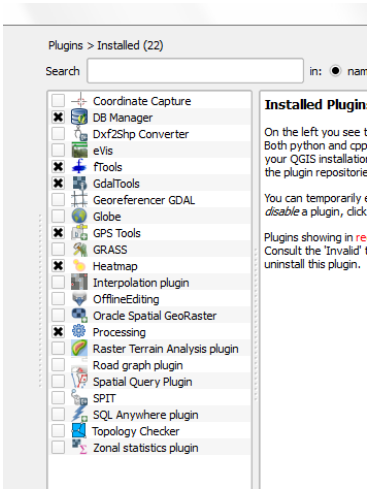
5. Turning On the GPS Tools Plugin

a) Click on Plugins in the menus area

b) Click on Manage Plugins

c) Find the GPS Tools Plugin and make sure the box next to it has an X in it (click on box if not)

d) Click on OK



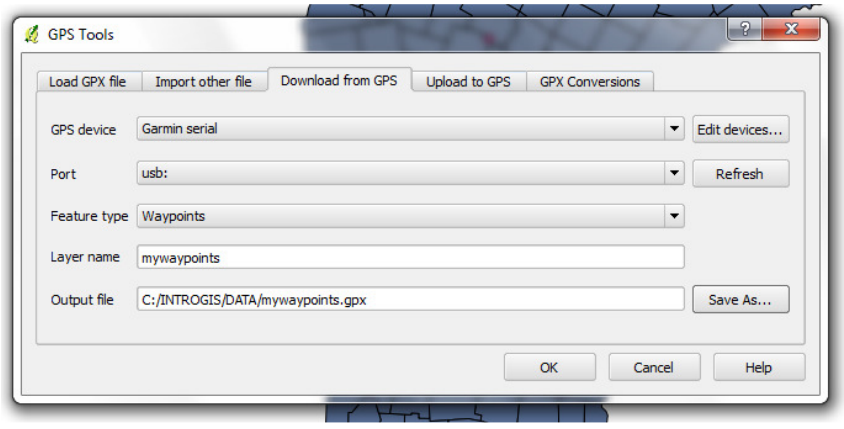
Adding Data From A GPS

a) Plug your GPS into your computer

Click on the GPS Tools icon to download data from your GPS to your computer.

i. Make sure that the fields are filled in as below and give your data a name, then browse to where you want to save it, then click OK

ii. Follow the same steps to download the tracks you collected (change Feature Type to Tracks)



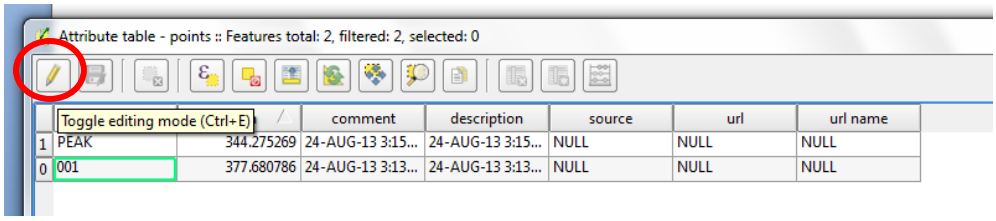
Creating and Editing Data

1. Editing Data

We can edit our data if we need to add or change attributes.

In order to edit the attributes of a data layer, we will highlight it, right click and then choose Open Attribute Table

a) Click on the Toggle Editing icon to turn on editing



b) Once editing is turned on, you can click on any of the values in the attribute table and change them by double clicking and typing.

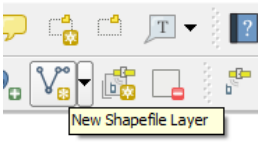
c) Hold your cursor over the other icons at the top of the attribute table window to see what they do. Notice that you can add a new column and you can delete columns. You ARE changing the data when you perform these actions, so be careful!

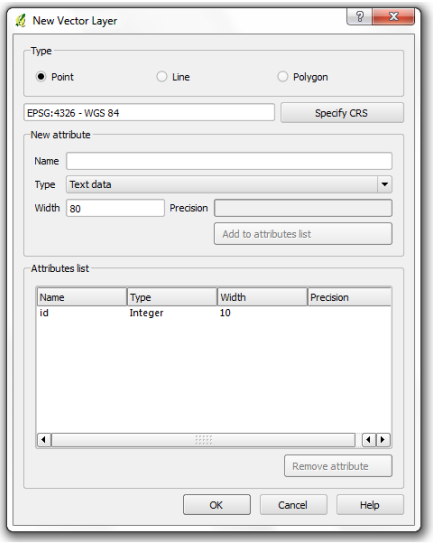
d) Click on the Field Calculator button to see that you can calculate values to populate new or existing fields.

e) When you turn editing off, you will be asked whether you want to save changes.

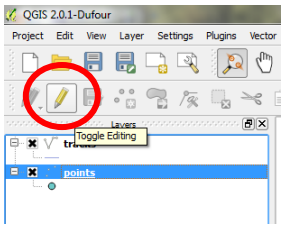
2. Creating New Vector Data

a. Click on the New Shapefile Layer button





b. Set the type of data you wish to create: Point, Line, or Polygon
c. Specify the Coordinate Reference System
d. Add attribute fields, choosing their specifications carefully
e. Click OK when you are done creating your shapefile
f. Save your new shapefile to an appropriate location
g. Zoom to a level appropriate to the data you wish to create
h. Click on the Toggle Editing button to turn editing on.
i. Click on the Add Feature button next to the editing toggle and then start clicking on the map to add features.



j. If you are creating point features you will be given the opportunity to fill in the attribute fields each time you click to add a point.
k. If you are creating line or polygon features, you will right click to indicate you are done with that particular feature, and then you will be able to edit the attributes.

Online Resources:

The most important “other data source” and technical advice resource: Regional Planning Commissions
http://www.vcgi.org/commres/?page=./rpc/default_content.cfm

Other States have organizations similar to VCGI, visit VCGI's web site to see current links to those states' data warehouses.

Many Federal Agencies make GIS data available for download. Search online or contact VCGI to ask for links and suggestions if you are looking for something specific (and not available from VCGI).